Multi-mode Handheld Radioisotope Identification Instrument

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The official link for this solicitation is:
http://www.acq.osd.mil/osbp/sbir/solicitations/sbir20152/index.shtml

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Description:

DTRA is seeking development of handheld radioisotope identification instrumentation with extended capabilities for identifying and categorizing isotopic sources. Passive measurements of gamma-ray signatures can be adversely compromised by shielding around the source. Neutrons are an additional signature that may either substantiate a finding or, more importantly, elucidate an anomaly that may arise from purposeful shielding. Currently offered instruments tend to optionally include neutron detectors of limited sensitivity that can be added to otherwise, gamma-ray centered designs. Of particular interest is to significantly increase thermal neutron sensitivity to a minimum of 15 cps/nv. Furthermore, instrumentation may also find a role in verification and inspections, and determining the presence of particular Pu isotopes (or their enrichment) through fast neutron spectroscopy would be beneficial. Note here that such a goal specifically requires sensitivity to energetic neutrons (to several MeV). It is preferable that the instrument is capable of accomplishing all detection functions without need for optional sensors that may increase the unit size, weight, or power consumption. The preferred form-factor is that of a compact instrument than can be personally worn or carried in a holster, allowing for hands-free operation. Examples of operation and form would be the identiFinder ® R400 and HDS-101GN. The instrument should meet or exceed the requirements of the relevant ANSI N42.34[1] standard for handheld instruments for the detection and identification of radionuclides, and include the capability to distinguish neutrons by energy (thermal versus fast). Solutions must employ low-power electronics and need to be battery operated with useful lifetime targets of 8+ hours between recharge or replacement. There is a high desire for

solutions that are physically robust and insensitive to adverse environmental conditions. The systems should be capable of identifying radioisotopic sources in mixed radiation (gamma plus neutron) environments. Instruments may be entirely self-contained or may utilize a short range wireless connection (e.g. Bluetooth) to commonly available tablet, laptop or smartphone devices for user interaction. Overall practicality of the operating conditions and ergonomics should be a factor in selecting packaging designs. For gamma-rays, it is desirable to utilize detectors that can achieve an energy resolution of < 5% FWHM at 662 keV. Additionally, the sensitivity should be greater than 1000 cps/μSv/hr for Cs-137. Commercial radioisotope identification software can be used. Ultimately, it is preferable that the instrument be capable of running GADRAS software[2] for radioisotope identification. Minimally, it should provide file formats compatible with the ANSI N42.42 standard[3]. PHASE I: Identify key operational components and develop the initial design of the handheld radioisotope identification instrument. Extensive modelling studies must be performed to demonstrate detector sensitivity, and capability for gamma, fast and thermal neutron detection and radioisotope identification. Demonstrate pathways to meeting performance goals in Phase II. PHASE II: Develop a prototype instrument that accomplishes the goals of gamma-ray, thermal and fast neutron measurements. The instrument shall not be dependent on post-acquisition analysis of data. Incorporate GADRAS or other radioisotope identification software. Demonstrate radioisotopic identification consistent with N42.34, identifying areas where the prototype diverges from the standard. Demonstrate the application of neutron detection to identification of radioisotopes with specific examples of SNM. PHASE III: DUAL USE APPLICATIONS: Develop a commercial instrument, with suitable partners as needed, for military applications of interest to DTRA as well as domestic applications to support first responders and regulatory inspections, border and port security, power plant maintenance and environmental clean-up.